WHAT IS CLAIMED IS:

1. An imaging method for generating an enhanced optical image of a scene, comprising the steps of:

(a) generating at least first and second optical image data corresponding to an optical image input of the scene taken at a single exposure, the optical image input having a wide input dynamic range with at least higher and lower dynamic range portions, the higher dynamic range portion having an upper range limit that serves as an upper range limit of the wide input dynamic range, the lower dynamic range portion having a lower range limit that is lower than the upper range limit of the higher dynamic range portion and that serves as a lower range limit of the wide input dynamic range, the first optical image data having a dynamic range corresponding to the higher dynamic range portion, the second optical image data having a dynamic range corresponding to the lower dynamic range portion; and

(b) combining the first and second optical image data to result in optical image output data corresponding to the enhanced optical image of the scene.

2. The imaging method according to Claim 1, wherein the first and second optical image data are generated by an image generating device that includes:

an optical imaging lens for providing the optical image input;

an image sensing unit, coupled to the optical imaging lens, for generating input optical image signals corresponding to the optical image input;

at least first and second video amplifiers coupled to the image sensing unit and configured to process the input optical image signals so as to generate respectively first and second optical image signals, wherein the first optical image signals have a dynamic range corresponding to the higher dynamic range portion, and wherein the second optical image signals have a dynamic range corresponding to the lower dynamic range portion; and

at least first and second analog-to-digital converters coupled respectively to the first and second video amplifiers, the first and second analog-to-digital converters converting the first and second optical image signals so as to obtain the first and second optical image data respectively therefrom.

3. The imaging method according to Claim 2, further comprising the step of adjusting bias and gain settings of the first and second video amplifiers in accordance with the range limits of the higher and lower dynamic range portions of the wide input dynamic range.

4. The imaging method according to Claim 3, further comprising the steps, prior to adjusting the bias and gain settings of the first and second video amplifiers, of:

determining the higher and lower dynamic range portions of the wide input dynamic range by analyzing light level coordinate distribution of image pixel data that constitute one of the first and second optical image data from the first and second analog-to-digital converters; and

determining the bias and gain settings of the first and second video amplifiers so as to correspond with the range limits of the higher and lower dynamic range portions.

5. The imaging method according to Claim 4, wherein, in the step of determining the higher and lower dynamic range portions of the wide input dynamic range:

the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number;

the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number; and

a lower range limit of the higher dynamic range portion and an upper range limit of the lower dynamic range portion are adjusted until a total number of the image pixel data having light levels that fall in either one of the higher and lower dynamic range portions is

greater than a predetermined pixel threshold number.

6. The imaging method according to Claim 2, wherein the image sensing unit includes first and second image sensors coupled respectively to the first and second video amplifiers, the imaging method further comprising the step of adjusting integration times of the first and second image sensors, and bias settings of the first and second video amplifiers in accordance with the range limits of the higher and lower dynamic range portions of the wide input dynamic range.

7. The imaging method according to Claim 6, further comprising the steps, prior to adjusting the integration times and the bias settings, of:

determining the higher and lower dynamic range portions of the wide input dynamic range by analyzing light level coordinate distribution of image pixel data that constitute one of the first and second optical image data from the first and second analog-to-digital converters; and

determining the integration times and the bias settings so as to correspond with the range limits of the higher and lower dynamic range portions.

8. The imaging method according to Claim 7, wherein, in the step of determining the higher and lower dynamic range portions of the wide input dynamic range:

the upper range limit of the higher dynamic range portion is the largest light level coordinate

distributed with a number of the image pixel data that is above a predetermined light level threshold number;

the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number; and

a lower range limit of the higher dynamic range portion and an upper range limit of the lower dynamic range portion are determined by finding a non-significant dynamic range portion of the wide input dynamic range of the optical image input, the non-significant dynamic range portion encompassing a greatest number of consecutive light level coordinates distributed with a number of the image pixel data that is below the predetermined light level threshold number, the lower range limit of the higher dynamic range portion being an upper range limit of the non-significant dynamic range portion, the upper range limit of the lower dynamic range portion being a lower range limit of the non-significant dynamic range portion.

9. The imaging method according to Claim 8, wherein, in the step of determining the higher and lower dynamic range portions of the wide input dynamic range, the predetermined light level threshold number is adjusted until a total number of the image pixel data having light levels that fall in either one of the higher and lower

dynamic range portions is greater than a predetermined pixel threshold number.

10. The imaging method according to Claim 1, further comprising the step of applying neighborhood transform processing to the first and second optical image data prior to step (b).

11. The imaging method according to Claim 4, wherein, in the step of determining the higher and lower dynamic range portions of the wide input dynamic range:

the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number;

the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number;

a lower range limit of the higher dynamic range portion is determined by inspecting successive ones of the light level coordinates in a descending order starting from the upper range limit of the higher dynamic range portion until a light level coordinate distributed with a number of the image pixel data that is below the predetermined light level threshold number is detected; and

an upper range limit of the lower dynamic range portion is determined by inspecting successive ones of

the light level coordinates in an ascending order starting from the lower range limit of the lower dynamic range portion until a light level coordinate distributed with a number of the image pixel data that is below the predetermined light level threshold number is detected.

12. An imaging apparatus for generating an enhanced optical image of a scene, comprising:

an image generating device for generating at least first and second optical image data corresponding to an optical image input of the scene taken at a single exposure, the optical image input having a wide input dynamic range with at least higher and lower dynamic range portions, the higher dynamic range portion having an upper range limit that serves as an upper range limit of the wide input dynamic range, the lower dynamic range portion having a lower range limit that is lower than the upper range limit of the higher dynamic range portion and that serves as a lower range limit of the wide input dynamic range, the first optical image data having a dynamic range corresponding to the higher dynamic range portion, the second optical image data having a dynamic range corresponding to the lower dynamic range portion; and

an image combining device, coupled to the image generating device, for combining the first and second optical image data to result in optical image output data corresponding to the enhanced optical image of the

scene.

13. The imaging apparatus according to Claim 12, wherein the image generating device comprises:

an optical imaging lens for providing the optical image input;

an image sensing unit, coupled to the optical imaging lens, for generating input optical image signals corresponding to the optical image input;

at least first and second video amplifiers coupled to the image sensing unit and configured to process the input optical image signals so as to generate respectively first and second optical image signals, wherein the first optical image signals have a dynamic range corresponding to the higher dynamic range portion, and the second optical image signals have a dynamic range corresponding to the lower dynamic range portion; and

at least first and second analog-to-digital converters coupled respectively to the first and second video amplifiers, the first and second analog-to-digital converters converting the first and second optical image signals so as to obtain the first and second optical image data respectively therefrom.

14. The imaging apparatus according to Claim 13, further comprising a control device, coupled to the first and second video amplifiers, for adjusting bias and gain settings of the first and second video amplifiers in accordance with the range limits of the higher and lower

dynamic range portions of the wide input dynamic range.

15. The imaging apparatus according to Claim 14, wherein the control device is further coupled to one of the first and second analog-to-digital converters, and determines the higher and lower dynamic range portions of the wide input dynamic range so as to determine the bias and gain settings of the first and second video amplifiers by analyzing light level coordinate distribution of image pixel data that constitute one of the first and second optical image data from said one of the first and second analog-to-digital converters.

16. The imaging apparatus according to Claim 15, wherein:

the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number, and the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number;

the control device adjusting a lower range limit of the higher dynamic range portion and an upper range limit of the lower dynamic range portion until a total number of the image pixel data having light levels that fall in either one of the higher and lower dynamic range portions is greater than a predetermined pixel threshold

number.

17. The imaging apparatus according to Claim 15, wherein the control device includes:

an image processor coupled to the first and second video amplifiers and to said one of the first and second analog-to-digital converters;

a data storage unit, coupled to the image processor, for storing range information of the higher and lower dynamic range portions of the wide input dynamic range therein; and

a timing controller, coupled to the image processor and the image sensing unit, for controlling integration time of the image sensing unit.

18. The imaging apparatus according to Claim 13, wherein the image generating device further includes first and second image buffer units, coupled to the image combining device and to a respective one of the first and second analog-to-digital converters, for storing the first and second optical image data therein, respectively.

19. The imaging apparatus according to Claim 18, wherein each of said first and second image buffer units is a line buffer.

20. The imaging apparatus according to Claim 13, wherein the image sensing unit includes first and second image sensors coupled respectively to the first and second video amplifiers, the imaging apparatus further comprising a control device, coupled to the first and

second image sensors and the first and second video amplifiers, for adjusting integration times of the first and second image sensors, and bias settings of the first and second video amplifiers in accordance with the range limits of the higher and lower dynamic range portions of the wide input dynamic range.

21. The imaging apparatus according to Claim 20, wherein the image generating device further includes an image splitter, disposed between the optical imaging lens and the first and second image sensors, for splitting the optical image input and for providing split optical image inputs to the first and second image sensors, respectively.

22. The imaging apparatus according to Claim 20, wherein the control device is further coupled to one of the first and second analog-to-digital converters, and determines the higher and lower dynamic range portions of the wide input dynamic range so as to determine the integration times and the bias settings by analyzing light level coordinate distribution of image pixel data that constitute one of the first and second optical image data from said one of the first and second analog-to-digital converters.

23. The imaging apparatus according to Claim 22, wherein:

the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that

is above a predetermined light level threshold number, and the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number;

the control device further determining a lower range limit of the higher dynamic range portion and an upper range limit of the lower dynamic range portion by finding a non-significant dynamic range portion of the wide input dynamic range of the optical image input, the non-significant dynamic range portion encompassing a greatest number of consecutive light level coordinates distributed with a number of the image pixel data that is below the predetermined light level threshold number, the lower range limit of the higher dynamic range portion being an upper range limit of the non-significant dynamic range portion, the upper range limit of the lower dynamic range portion being a lower range limit of the non-significant dynamic range portion.

24. The imaging apparatus according to Claim 23, wherein the control device adjusts the predetermined light level threshold number until a total number of the image pixel data having light levels that fall in either one of the higher and lower dynamic range portions is greater than a predetermined pixel threshold number.

25. The imaging apparatus according to Claim 12, wherein the image generating device includes neighborhood

transform means for applying neighborhood transform processing to the first and second optical image data prior to reception by the image combining device.

26. The imaging apparatus according to Claim 25, wherein the image generating device further includes first and second image buffer units, coupled to the image combining device and the neighborhood transform means, for storing the first and second optical image data therein, respectively.

27. The imaging apparatus according to Claim 26, wherein each of the first and second image buffer units is a line buffer.

28. The imaging apparatus according to Claim 22, wherein the control device includes:

an image processor coupled to the first and second video amplifiers and to said one of the first and second analog-to-digital converters;

a data storage unit, coupled to the image processor, for storing range information of the higher and lower dynamic range portions of the wide input dynamic range therein; and

a timing controller, coupled to the image processor and the first and second image sensors, for controlling the integration times of the first and second image sensors.

29. The imaging apparatus according to Claim 15, wherein the control device is further coupled to the image

combining device so as to provide range information of the higher and lower dynamic range portions of the wide input dynamic range thereto, the optical image output data including attribute information to permit reconstruction of the first and second optical image data therefrom.

30. The imaging apparatus according to Claim 15, wherein:

the upper range limit of the higher dynamic range portion is the largest light level coordinate distributed with a number of the image pixel data that is above a predetermined light level threshold number, and the lower range limit of the lower dynamic range portion is the smallest light level coordinate distributed with a number of the image pixel data that is above the predetermined light level threshold number;

the control device determining a lower range limit of the higher dynamic range portion by inspecting successive ones of the light level coordinates in a descending order starting from the upper range limit of the higher dynamic range portion until a light level coordinate distributed with a number of the image pixel data that is below the predetermined light level threshold number is detected;

the control device further determining an upper range limit of the lower dynamic range portion by inspecting successive ones of the light level coordinates in an ascending order starting from the lower range limit of

the lower dynamic range portion until a light level coordinate distributed with a number of the image pixel data that is below the predetermined light level threshold number is detected.

31. An imaging method for generating an enhanced optical image of a scene, comprising the steps of:

(a) generating input optical image signals by sensing an optical image input of the scene at a single exposure, the optical image input having a wide input dynamic range with a plurality of dynamic range portions;

(b) processing the input optical image signals to obtain a plurality of optical image data during the single exposure, the optical image data having dynamic ranges that correspond respectively to the dynamic range portions; and

(c) combining the optical image data to result in optical image output data corresponding to the enhanced optical image of the scene.

32. The imaging method according to Claim 31, wherein the input optical image signals are processed by a plurality of video amplifiers in step (b), the imaging method further comprising the step of adjusting bias and gain settings of the video amplifiers in accordance with range limits of the dynamic range portions of the wide input dynamic range.

33. The imaging method according to Claim 32, further comprising the steps, prior to adjusting the bias and

gain settings of the video amplifiers, of:

segregating the wide input dynamic range into the dynamic range portions by analyzing light level coordinate distribution of image pixel data that constitute one of the optical image data; and

determining the bias and gain settings of the video amplifiers so as to correspond with range limits of the dynamic range portions.

34. The imaging method according to Claim 33, wherein, in the step of segregating the wide input dynamic range into the dynamic range portions, the number and the range limits of the dynamic range portions are determined such that a total number of the image pixel data having light levels that fall in any one of the dynamic range portions is greater than a predetermined pixel threshold number.

35. The imaging method according to Claim 31, further comprising the step of applying neighborhood transform processing to the optical image data prior to step (c).

36. An imaging apparatus for generating an enhanced optical image of a scene, comprising:

an image generating device including

an image sensing unit adapted to sense an optical image input of the scene at a single exposure and to generate input optical image signals corresponding to the optical image input sensed thereby, the optical image input having a wide input dynamic range with a plurality of dynamic range portions,

a plurality of video amplifiers coupled to the image sensing unit, and

a plurality of analog-to-digital converters coupled respectively to the video amplifiers,

the video amplifiers and the analog-to-digital converters cooperatively processing the input optical image signals to obtain a plurality of optical image data during the single exposure, the optical image data having dynamic ranges that correspond respectively to the dynamic range portions; and

an image combining device, coupled to the image generating device, for combining the optical image data to result in optical image output data corresponding to the enhanced optical image of the scene.

37. The imaging apparatus according to Claim 36, further comprising a control device, coupled to the video amplifiers, for adjusting bias and gain settings of the video amplifiers in accordance with range limits of the dynamic range portions of the wide input dynamic range.

38. The imaging apparatus according to Claim 37, wherein the control device is further coupled to one of the analog-to-digital converters, the control device segregating the wide input dynamic range into the dynamic range portions by analyzing light level coordinate distribution of image pixel data that constitute one of the optical image data from said one of the analog-to-digital converters, and determining the bias

and gain settings of the video amplifiers in accordance with range limits of the dynamic range portions.

39. The imaging apparatus according to Claim 38, wherein the control device determines the number and the range limits of the dynamic range portions such that a total number of the image pixel data having light levels that fall in any one of the dynamic range portions is greater than a predetermined pixel threshold number.

40. The imaging apparatus according to Claim 38, wherein the control device includes:

an image processor coupled to the video amplifiers and said one of the analog-to-digital converters;

a data storage unit, coupled to the image processor, for storing range information of the dynamic range portions of the wide input dynamic range therein; and

a timing controller, coupled to the image processor and the image sensing unit, for controlling integration time of the image sensing unit.

41. The imaging apparatus according to Claim 36, wherein the image generating device further includes a plurality of image buffer units, coupled to the image combining device and to a respective one of the analog-to-digital converters, for storing the optical image data therein, respectively.

42. The imaging apparatus according to Claim 41, wherein each of the image buffer units is a line buffer.

43. The imaging apparatus according to Claim 36, wherein the image generating device further includes neighborhood transform means for applying neighborhood transform processing to the optical image data prior to reception by the image combining device.

44. The imaging apparatus according to Claim 43, wherein the image generating device further includes a plurality of image buffer units, coupled to the image combining device and the neighborhood transform means, for storing the optical image data therein, respectively.

45. The imaging apparatus according to Claim 44, wherein each of the image buffer units is a line buffer.

46. The imaging apparatus according to Claim 38, wherein the control device is further coupled to the image combining device so as to provide range information of the dynamic range portions of the wide input dynamic range thereto, the optical image output data including attribute information to permit reconstruction of the optical image data therefrom.